IPP physicists and engineers passed a major milestone earlier this year, when they tested the entire assembled device, cooling the 200 tons of coils to the operating temperature, 4.5 kelvin. They discovered only minor, fixable glitches, Wan says, and are now undertaking the necessary tweaks and installing shielding materials and diagnostic devices. In August, they plan to inject hydrogen and fire up EAST's first plasma.

With the tokamak passing its cool-down test, Wan says the team was "finally able to get a good night's sleep." They are now planning experiments to explore how to control D-shaped plasmas. Tugging a plasma into a specific shape can create instabilities, Gentle says. Control is all the more difficult because superconducting coils respond poorly to current fluctuations. IPP will probe these issues. "That's where the science is going to be extremely valuable," says Hawryluk.

EAST has limitations. The most significant is that, unlike ITER, it will not attempt a burning plasma, in which at least half the energy needed to drive the fusion reaction is generated internally. ITER will use a combination of deuterium and tritium (hydrogen isotopes with, respectively, one and two neutrons in the nucleus), which fuse at a lower temperature than other gases, to achieve a burn. Because radioactive tritium requires specialized and expensive handling systems and shielding, EAST will use only hydrogen or deuterium.

That limitation is hardly dampening enthusiasm for the hot new kids on the block. IPP researchers, says Hawryluk, "have already put themselves on the fusion community map."

–DENNIS NORMILE

With reporting by Gong Yidong.

Asian Fusion

India, Korea, and possibly Japan are joining China in building next-generation tokamaks. These machines seek to fill a research gap on the road to the International Thermonuclear Experimental Reactor (ITER) by employing all-superconducting coils to study the physics of confining plasmas for long durations, which current tokamaks can't do.

■ India's Institute for Plasma Research is now commissioning its Steady State Superconducting Tokamak. An engineering test at cryogenic temperatures turned up problems that are now being addressed. Institute plasma physicist Y. C. Saxena says they are hoping to try a second engineering test later this month. If that goes well, they will attempt their first plasma in the summer. The $45 million project, launched in 1994, is the smallest of the new tokamaks. But Saxena says they believe they can help unravel the physics of long-lasting plasmas.

■ The most ambitious machine is the Korean Superconducting Tokamak Reactor (KSTAR), being built by the National Fusion Research Center in Daejeon. KSTAR relies on superconductors made from the more advanced niobium-tin alloy that ITER will employ. The $330 million project was delayed because of Korea's late-1990s economic crisis. Project Director Lee Gyung-su says they are now aiming for first plasma in early 2008.

■ For several years, Japan's Atomic Energy Agency has been studying the possibility of upgrading its JT-60 tokamak to be fully superconducting. Japan may get funding for the upgrade from the European Union as compensation for its assent on the agreement to build ITER in France. An agency spokesperson says key decisions are under negotiation. **–D.N.**

SCIENTIFIC OPENNESS

Should Academics Self-Censor Their Findings on Terrorism?

Some government-funded researchers believe their papers require special handling. But others say that creating such a gray area undermines academic freedom

Last year, after Detlof von Winterfeldt and his colleagues at the University of Southern California (USC) in Los Angeles finished a study on the likelihood and impact of a dirty bomb attack by terrorists on the Los Angeles harbor, they omitted some important details from a paper they posted on the Internet. Although the team had used no classified material, von Winterfeldt felt that self-censorship was prudent given the subject matter. It's also in line with draft guidelines being considered by the U.S. Department of Homeland Security (DHS), which funds the Center for Risk and Economic Analysis of Terrorism Events that he directs. "We were still able to present the methodology behind the analysis fully and effectively," he says. "It made perfect sense to make those changes."

But some scientists say that stance conflicts with academic freedom, and that the public deserves access to anything not explicitly classified. They worry that the actions of the USC researchers could serve as a model for restricting the conduct and dissemination of university research. Their concerns are tied to an ongoing effort by the Bush Administration to draw up common standards across federal agencies for withholding information under the rubric of sensitive but unclassified (SBU) material.

"The only appropriate mechanism for controlling information is classification," says Steven Aftergood, who runs the Project on Government Secrecy for the Federation of American Scientists. "If we want to gain the benefits of university research on problems of national security, we need to conduct it openly. Imposing restrictions short of classification is a slippery slope that will ultimately paralyze the academic process."

Universities have traditionally drawn a sharp line between classified and unclassified information, refusing to accept the ill-defined SBU category. Yet, in a 28 March meeting at the U.S. National Academies, DHS officials and directors of the six university centers funded by the agency discussed draft guidelines to control the dissemination of sensitive information generated by their research. The guidelines were developed by the center directors in collaboration with DHS officials. The academies agreed to be host because of their ongoing interest in the topic.

Besides recommending the scrubbing of papers before publication, the guidelines would have center directors decide whether proposed research projects are likely to produce sensitive information—loosely defined as information not easily available from public sources and/or of potential use to terrorists. Projects that fit that description would be subject to additional scrutiny. The results, says the document, could include "producing different version(s) of the findings for 'For Official Use Only' and for public dissemination, declin[ing] the proposed work, or mov[ing] it to a classified environment."

The guidelines simply acknowledge "the reality of a changing world," says Melvin Bernstein, acting director of DHS's Office of Research and Development, which helped set up the university centers with 3-year renewable grants. "There's an increasing recognition in the university community that there could be circumstances when researchers need to be careful about what can be disseminated."

Although Bernstein says it's too early to know whether the guidelines will become official policy, they appear consistent with a presidential directive issued last December ordering common standards across the

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government by the end of 2006 for handling SBU information. After talking with DHS officials, the center directors decided that writing some of the rules themselves would be better than having the government impose them. "We knew we had no choice. This thing was coming our way sooner or later," says Gary LaFree, co-director of the Study of Terrorism and Responses to Terrorism at the University of Maryland, College Park.

One reason that universities have resisted the SBU concept is its vagueness, which some academics fear could lead to federal agencies trying to set arbitrary restrictions on campus research. The executive branch itself seems confused about what information should be withheld from the public and why: The Government Accountability Office reported in March that agencies use 56 different SBU categories in deciding how to control information. Last week, Thomas E. "Ted" McNamara, an official in the Office of the Director of National Intelligence who is leading a federal effort to sort out the confusion, told a congressional panel that some of the government's procedures for handling SBU information "are not only inconsistent but are contradictory." McNamara expects to submit his recommendations next month on standardizing SBU procedures.

But a clearer definition of SBU is unlikely to end the debate. LaFree says the guidelines discussed at the academies meeting could have serious implications for research at the DHS centers. "They could lead to restrictions on the involvement of foreign students and researchers in certain projects," he says, adding that not all center directors are comfortable with the guidelines, despite their role in writing them. "That would be simply unacceptable."

LaFree's concern is not unfounded. In fact, the USC center has been developing procedures—not included in the draft guidelines—that would require foreign nationals to agree to certain conditions before being given access to sensitive information. (Von Winterfeldt won't say what those conditions might be.) Such procedures, critics say, could encourage principal investigators to drop foreigners from sensitive projects. That's already happened in some cases: Yacov Haimes of the University of Virginia in Charlottesville says he deliberately avoided including any foreign nationals when his research team did an unclassified study for the federal government 2 years ago on the risk of a high-altitude electromagnetic pulse attack on the United States.

> "While we have identified several additional effective countermeasures, **only limited details can be revealed for security reasons."**
>
> —Heather Rossof and Detlof von Winterfeldt

That approach could backfire on universities, warns Robert Hardy of the nonprofit Council on Governmental Relations in Washington, D.C. By placing restrictions on publishing, he says, the centers could risk losing the privileges that universities enjoy because they do fundamental research—defined as work whose results are "published and shared broadly within the scientific community." One important privilege is being able to involve foreign nationals in any research project without obtaining a government license.

Randolph Hall, vice president for research advancement at USC and a researcher at the USC center, disagrees with Hardy's interpretation of what qualifies as open publishing. Taking some information out of a paper is not the same as preventing a researcher from publishing, he says, and shouldn't have any bearing on the exemption given to institutions. "It's not unusual for reports at any institution to go through editing, even if some of the changes might be purely grammatical," Hall says. "Similarly, editing out sensitive data is more of a revision than a restriction."

Shaun Kennedy, a chemical engineer and deputy director of the National Center for Food Protection and Defense at the University of Minnesota, Twin Cities, says the proposed guidelines bump up against state laws meant to ensure public access to information. "If I have a For Official Use Only version of a paper in a folder, shredding it would be a violation of the Minnesota Data Practices Act," says Kennedy, adding that the center decided not to start a proposed project analyzing chinks in the nation's food supply chain partly because of that provision. (Instead, the Food and Drug Administration is doing the research internally.)

Some scientists say that there's a more fundamental issue at stake, namely, whether a limit on what goes into the open literature might actually weaken the nation's security. "If you don't publish the information, it might reduce the chances of an attack. But just as likely it could reduce the chances of another researcher coming up with a solution. If the risks are so great, then why shouldn't the research be classified?" asks Toby Smith of the Association of American Universities.

LaFree thinks the argument makes sense. What universities bring to the stable, he says, "is the best minds to look at the data that we pass around. If we end up putting a lot of fences around information, that'll defeat the purpose of doing this type of research in an academic environment."

Von Winterfeldt doesn't believe that a little secrecy will doom research, but he does agree that universities should set and implement policies to protect SBU information. Panels similar to Institutional Review Boards could be set up to do the job, he suggests. And he acknowledges that the panels will have to wrestle with some tough questions. Asked why a sentence in his team's paper on using a helicopter to disperse a dirty bomb didn't qualify as sensitive information, von Winterfeldt said, "It's in the gray zone. I'll discuss it at my next meeting with the author and our staff."

–YUDHIJIT BHATTACHARJEE

Playing it safe. USC researchers removed some details from their paper on the risk and impact of a dirty bomb attack on Los Angeles harbor (*above*) to avoid helping terrorists. Inset shows a model of how radiation might spread.

CREDITS: DAVID MCNEW/GETTY IMAGE; (INSET) ADAPTED FROM A REPORT BY H. ROSOFF AND D. VON WINTERFELDT (OCTOBER 2005)

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